ORIGINAL ARTICLE

Are changes in objective working hour characteristics associated with changes in work-life conflict among hospital employees working shifts? A 7-year follow-up

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ABSTRACT

Objective To investigate whether changes in objective working hour characteristics are associated with parallel changes in work-life conflict (WLC) among hospital employees.

Methods Survey responses from three waves of the Finnish Public Sector study (2008, 2012 and 2015) were combined with payroll data from 91 days preceding the surveys (n=2 482, 93% women). Time-dependent fixed effects regression models adjusted for marital status, number of children and stressfulness of the life situation were used to investigate whether changes in working hour characteristics were associated with parallel change in WLC. The working hour characteristics were dichotomised with cut-points in less than or greater than 10% or less than or greater than25% occurrence) and WLC to frequent versus seldom/none.

Results Change in proportion of evening and night shifts and weekend work was significantly associated with parallel change in WLC (adjusted OR 2.19, 95% CI 1.62 to 2.96; OR 1.71, 95% CI 1.21 to 2.44; OR 1.63, 95% CI 1.194 to 2.22, respectively). Similarly, increase or decrease in proportion of quick returns (adjusted OR 1.45, 95% CI 1.10 to 1.89) and long work weeks (adjusted OR 1.26, 95% CI 1.04 to 1.52) was associated with parallel increase or decrease in WLC. Single days off and very long work weeks showed no association with WLC.

Conclusions Changes in unsocial working hour characteristics, especially in connection with evening shifts, are consistently associated with parallel changes in WLC.

Key messages

What is already known about this subject?

- Working times and work-life conflict have mainly been studied using subjective data. In general, shift work and long working hours seem to increase work-life conflict.

What are the new findings?

- Objective working hour data shows that increase or decrease in unsocial working hour characteristics is associated with parallel increase or decrease in work-life conflict.

How might this impact on policy or clinical practice?

- Especially reducing the proportion of evening shifts, but also reducing the proportion of night shifts, weekend work and quick returns can be used to reduce work-life conflict among shift workers.

INTRODUCTION

In the 24/7 society, a strong need exists to facilitate combining work and life. As the number of women, dual-earner couples and single parents in the workforce will continue to increase,[1] the relevance of work-life balance will also increase. European Agency for Safety and Health at Work Research has classified work-life conflict (WLC) as one of the most emerging psychosocial risk factors and highlights its negative consequences for the workforce.[2]

Mutually incompatible demands from the work and non-work domains are common in today's work life and can lead to WLC.[3] In general, WLC is more common among women than men,[4] and the prevalence of WLC is higher among full-time than part-time workers.[5] WLC has substantial consequences for employees, their family members and employers[6] affecting well-being, productivity and costs. WLC is associated with negative consequences such as job strain,[7] sleep complaints,[4 8] depressive symptoms[8 9] and increased sickness absence.[10]

In large-scale studies, the occurrence of WLC has consistently been higher among shift workers than among day workers.[11–13] Nearly every third employee in rotating schedules reported poor work-life balance in the recent European Working Conditions Survey, compared with 16% of day workers.[11] Among healthcare professionals, the occurrence of WLC has been remarkably high, ranging from one-third[13] up to or over 50%.[14–16]

There is a paucity of studies investigating the associations between different working time regimens and WLC. Most of the earlier studies excluded shift workers, and those among shift workers have mostly been cross-sectional.[14–18]

A prospective study indicated that a forward-rotating schedule was related to less work-family conflict and better sleep quality than backward-rotating schedule.[19] An Australian study[20] with a

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series of 2-year follow-ups showed that longer working hours distinguished those with a chronic work-family conflict from those whose WLC diminished. Additionally, employment in a high-status occupation has been associated with chronic work-family conflict in both genders.[21] In a 4-year follow-up among physicians, on-call duties were associated with higher levels of work interference with family.[22]

To date, the majority of the studies have lacked objective data of working hours and have been based on self-reports to assess exposure to different aspects of working hours. Survey data can bias the assessment of shift work especially among shift workers without night shifts.[23] Furthermore, the earlier studies of shift work and WLC have had other methodological problems, for example, homogenous populations, lack of or a short follow-up time, low overall or follow-up response rate and little adjustment for confounders.[24 25] To tackle these earlier methodological challenges, this study had the unique opportunity to use a large cohort data with objective payroll data on working times and accounted for multiple confounders.

Unsocial working hour characteristics refer to long or non-standard working hour characteristics, that is, working at socially valuable times of the day and week and having time off during socially less valuable times.[26] In a previous cross-sectional study,[13] we found an increased likelihood of WLC in association with several unsocial working hour characteristics. With this follow-up data, we aimed to investigate whether changes in unsocial working hour characteristics (long weekly working hours, evening and night work, quick returns, single days off and weekend work) would result into parallel changes in WLC.

METHODS

Study sample

This study is part of the Finnish Public Sector (FPS) study comprising employees of 10 towns and six hospital districts in Finland. In this study, the inclusion criteria were survey data from 2008, 2012 and 2015 FPS surveys of the six hospital districts (response rates 72%, 71% and 69%, respectively), current contract of employment with period-based work (114:45 hours/3 week) and using Titania shift scheduling software.[23]

As described earlier,[13 23] the individual surveys were linked to the payroll data of working hours from the 91 days prior to answering each of the questionnaires. Additionally, the employees were required to have a period-based work contract (114:45 hours/3 weeks) and to have at least 31 work shifts during the 91-day period (figure 1). Regular day workers were excluded as they do not work on a period-based work contract. Additionally, fixed evening and night shift workers were also excluded.

The sample included 2481 employees of which 93% (n=2 303) were women and 7% men (n=178). Employees' average age was 44 years (SD 8.15), and they had on average 15 years shift work experience (SD 9.83). Majority of participants had a full-time work (87%, n=2 155) and children under 18 years living in the same household (90%, n=1 278). The employees' most common job titles were nurse (40%, n=966), departmental secretary (10%, n=238), practical nurse (6%, n=138), laboratory nurse (4%, n=107) and X-ray nurse (4%, n=103).

Payroll data

The payroll-based daily working hour data was retrieved from the shift scheduling programme (Titania, CGI Finland, Helsinki, Finland). Validated sampling software (provided by CGI Finland) was used to retrieve the data from realised rosters (see Härmä *et al*[27] for further details).

The payroll data that were used in this study have been described in detail earlier.[27] The working hour characteristics were those previously used.[13] We utilised dichotomised variables of percentage of long work weeks (cut-point >25% for 40 hour/week and cut-point >25% for 48 hour/week), percentage of evening and night shifts of all the work shifts (cut-point >10%), percentage of quick returns (<11 hour shift interval) of all shift intervals (cut-point >25%), percentage of weekend work of all the weekends (cut point >25%) and percentage of single free days of all the free days (cut-point >25%). Each shift-dependent

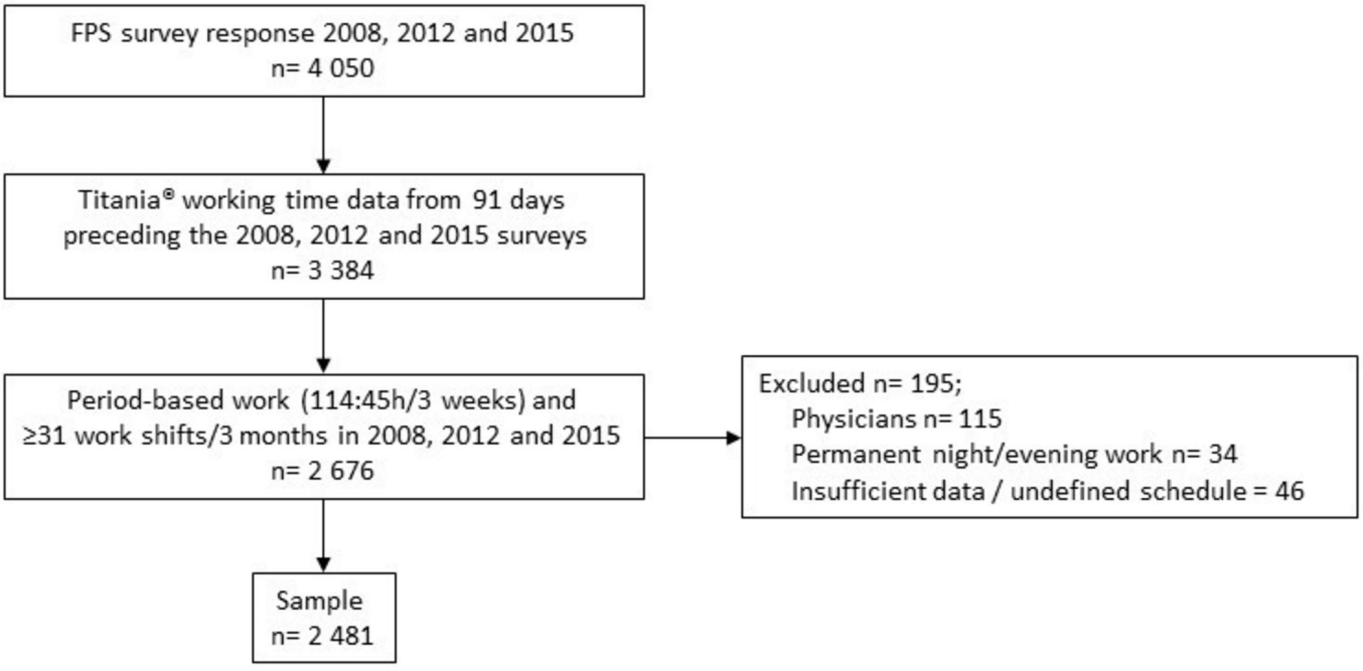

Figure 1 The flow chart of the selection of the study participants. FPS, Finnish Public Sector.

Table 1 Changes in work-life conflict during the follow-up 2008–2015

	2008–2015*
	N (%)
Stable low†	950 (43.3)
Stable high†	344 (15.7)
Increased	337 (15.3)
Decreased	335 (15.3)
Two changes over time: increase–decrease	134 (6.1)
Two changes over time: decrease–increase	94 (4.3)

*Altogether three time points: 2008, 2012 and 2015.
†Employees with no change in work-life conflict excluded from further analysis.

characteristics occurred approximately once a week and week-related characteristics (weekly working hours) once a month. The cut-points[27] are included in FIOH's current recommendations for acceptable working hour characteristics in the FPS.

Survey variables

WLC was surveyed with a question: 'How often you feel that your work takes too much time or energy from your family-life or life?' with a five-point Likert-type scale from never to very often adapted from.[28] The answers 'often' and 'very often' were dichotomised as having WLC.

Ethical issues

The hospital districts gave written permission to the Finnish Institute of Occupational Health to use the employers' working time registries. All data were anonymised. Answering to the FPS survey was voluntary and the completed questionnaire acted as an informed consent.[29]

Statistical methods

The statistical analyses were conducted with SAS V.9.4 and IBM SPSS Statistics V.24. Fixed effects time-dependent logistic regression analysis was used to test whether significant increase or decrease in unsocial working hour characteristics would show a parallel change in WLC (increase in working hour characteristic—increase in WLC or decrease in working hour characteristic—decrease in WLC). The fixed effects regression model has the advantage that each individual serves as his or her own control and time-invariant (fixed) confounding (non-observed individual and environmental factors) are eliminated.[30] First, a crude model was used and then model adjusting for various covariates. The covariates were marital status (married or cohabiting vs divorced, estranged, single or widow), number of small (0–6 years) and school-aged (7–18 years) children, stressfulness of the overall life situation during the past 12 months (a five-point Likert-type scale from not burdensome to extremely burdensome), and perceived health (a five-point Likert-type scale from good to poor).[31] The number of small children was classified into zero children, one children, at least two children and missing information, whereas the number of school-aged children was classified into zero children, one children, two children, at least three children and missing information.

We tested interactions by age (≤39, 40–49 and ≥50 years) and sex and performed stratified analysis for interactions with $P<0.10$.[32]

RESULTS

The proportion of employees with perceived WLC was similar through the follow-up (35% in 2008, 34% in 2012 and 2015). The employees with increased or decreased WLC (one or two changes during the 7-year follow-up) were included in the analysis and, respectively, the employees with stable low or stable high WLC were excluded (table 1).

The average proportions of the studied working hour characteristics were rather stable over time (table 2).

Fixed effects regression model showed similar results in both crude and adjusted model. Changes in proportion of evening (adjusted OR 2.19, 95% CI 1.62 to 2.96) and night shifts (OR 1.71, 95% CI 1.21 to 2.44) and weekend work (OR 1.63, 95% CI 1.194 to 2.22) had highest odds for parallel change in WLC. Similarly, reduction/increase in the proportion of quick returns and long work weeks were associated with parallel change in WLC. Proportion of single days of and very long work weeks seemed not to be associated with parallel change in WLC. No significant age or sex interactions were found in any of the studied working hour characteristics. (table 3).

DISCUSSION

This prospective study with objective working hour data and a 7-year follow-up investigated whether changes over cut-point in proportions of unsocial working hour characteristics result in parallel change in WLC among hospital employees. The main result shows that increase or decrease in the proportion of evening shifts is followed by parallel increase or decrease in WLC. Similarly, the increase or decrease in proportion of night shifts, weekend work, quick returns and long work weeks result in parallel change in WLC. Age and sex interactions were tested with regard to all the working hour characteristics, but none of these analysis yielded significance.

The authors are not aware of earlier longitudinal studies that would have used objectively measured working hour characteristics to investigate the association with perceived WLC. The previous cross-sectional studies have shown an association between long working hours,[11 33] weekend work[34 35] and quick returns[36] with WLC. This study highlights the role of several

Table 2 The average proportions (%) of working hour characteristics during past 91 days in 2008–2015

	2008		2012		2015	
Percentages of…	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
>40 hour work weeks of all work weeks	920	23.6 (17.2)	918	26.6 (22.8)	920	22.7 (19.6)
>48 hour work weeks of all work weeks	920	3.1 (6.5)	918	4.0 (10.0)	920	3.1 (6.7)
Quick returns (<11 hour) of all shift intervals <48 hour	920	13.5 (14.8)	920	11.2 (13.6)	920	9.5 (12.6)
Single days off of all day off-periods	730	13.3 (9.7)	667	7.9 (15.1)	530	19.1 (11.4)
Evening shifts of all shifts	920	18.8 (16.8)	920	17.5 (17.3)	920	17.0 (18.3)
Night shifts of all shifts	920	8.5 (13.9)	920	7.9 (15.1)	920	7.5 (14.5)
Weekend work of all weekends	920	27.7 (25.4)	920	26.2 (25.6)	920	21.8 (22.9)

Table 3 OR with 95% CI for change across the cut-point in working hour characteristics during past 91 days and change in work-life conflict (often/very often vs seldom/never) during 2008–2015

		Fixed effects regressions						
		Crude model		Adjusted model*		Age interaction	Sex interaction	Missing information of children interaction
Proportion of…	Cut Point	N	OR (95% CI)	N	OR (95% CI)	Sig.	Sig.	Sig.
>40 work weeks of all work weeks	25%	920	1.25 (1.03 to 1.50)	907	1.26 (1.04 to 1.52)	0.29	0.14	0.07
>48 hour work weeks of all work weeks	10%	920	1.23 (0.95 to 1.59)	907	1.29 (0.98 to 1.69)	0.50	0.49	0.56
Quick returns (<11 hour) of all shift intervals <48 hour	25%	920	1.43 (1.10 to 1.85)	907	1.45 (1.10 to 1.89)	0.14	0.88	0.33
Single days off of all day off-periods	25%	582	1.03 (0.77 to 1.37)	575	1.06 (0.79 to 1.43)	0.51	0.90	0.14
Evening shifts of all shifts	10%	920	2.18 (1.63 to 2.93)	907	2.19 (1.62 to 2.96)	0.81	0.87	0.09
Night shifts of all shifts	10%	920	1.54 (1.10 to 2.16)	907	1.71 (1.21 to 2.44)	0.65	0.81	0.36
Weekend work of all weekends	25%	920	1.49 (1.11 to 2.00)	907	1.63 (1.19 to 2.22)	0.38	0.42	0.06

*Adjusted for time-dependent variables: marital status (married or cohabiting/divorced, estranged, single, widow or widower), number of small (0–6 years) and school-aged (7–18) children, perceived health and the stressfulness of the overall life situation during the past 12 months.

working hour characteristics but shows that especially evening work is detrimental for WLC.

According to our results, it seems that experiencing WLC was similar in all the age groups when number of children was included in the analysis. Likewise, Rantanen *et al*[37] found out that WLC is not limited to early part of employees' working career. There are both earlier results showing that increasing number of children is associated with WLC[38] and that number of children is not associated with WLC, but having a small child is.[20] It is likely that the dual breadwinner model combined with external child and elderly care that is prominent in the Nordic countries partly explains the lack of sex differences in experiencing WLC.[39]

Improving work-life balance is important among shift workers, as previous research shows an increased risk for changing from shift to day work[21] or from full-time to part-time work[5] as a consequence of WLC. In this data, nearly 90% of the employees were full-time workers and there was a slightly increasing proportion of full-time workers in the sample (data not shown). It seems presumable that hospital employees do not adjust their working hours as means of reducing WLC.

Strengths and limitations

The main strength of this study was the use of objective working hour data that allowed determining the exact proportion of, for example, quick returns and night shifts. This study strengthens previous results[13] based on partially the same dataset, and earlier survey and mostly cross-sectional results, that long working hours,[11] evening shifts,[32] night shifts, quick returns[36 40] and weekend work[34 35] are associated with WLC and, newly, that the association is bidirectional. Another strength of this study was the use of rich survey data that allowed us to take into account several individual-level confounding factors, including marital status, number of children and the stressfulness of the overall life situation as well as time-varying rating of perceived health.

A limitation is the use of single item to capture WLC. However, many previous studies have also used either a single item or a shortened version of existing scales.[19 34 35 41] On the other hand, the selected item of WLC was broader than work-family conflict, as it covered both family issues and other aspects of non-work. The concept work-family conflict, which most of the previous research has used, emphasises the family in a traditional way including parents and child(ren) which diminishes the challenges that single persons or childless couples face combining work and life.[42 43] Another limitation is the relatively large proportion of missing information in the question of number of children in the questionnaires.

Also some further limitations have to be addressed. Although the original sample size was large, the proportion of employees staying in the cohort for 7 years was rather small. The dropout can be due to multiple reasons, for example, retiring, long-term leaves and changing workplace or profession. The proportion of men was low, representing the proportion of male employees in the Finnish healthcare sector. We analysed the data including women only, and the results did not change (data not shown). However, the results regarding men should be generalised and interpreted very carefully and replicated in further studies.

In our previous cross-sectional study,[13] we found out that majority of unsocial working hour characteristics were associated with WLC in cross-sectional study design. The results of this study add to the previous results by shoving that reducing the proportion of, for example, evening shifts and quick returns results in parallel decrease in WLC. The results can be used in reducing WLC by reducing the proportions of working hour characteristics that are associated with WLC. It would be important to impact on retaining competent employees in healthcare sector.[14] Arrangements that improve work-life balance are appreciated also by employees that do not have a need to utilise them.[44]

CONCLUSION

In a 7-year follow-up, changes in most of the studied unsocial working hour characteristics were associated with parallel change in WLCt, especially in connection with evening shifts. Reducing the proportion of evening shifts, but also reducing the proportion of night shifts, weekend work and quick returns should be used to reduce WLC.

Contributors All the authors have participated in designing of the study and writing the manuscript. Statistical analyses were conducted by KK, AK and AO. We are in agreement with the content of the manuscript and with the order of authorship.

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Competing interests None declared.

Ethics approval The ethics committee of the Hospital District of Helsinki and Uusimaa (HUS) approved this study as part of the Finnish Public Sector study ethical approval (HUS 1210/2016).

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